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ABSTRACT

Seven courses of instruction are provided for a fiberglass lamination program for adult and postsecondary classes. The courses cover these areas: (1) mold preparation, (2) gelcoating, (3) fiberglass lamination, (4) stiffening, (5) popping, (6) grinding, and (7) mold making. Information provided at the beginning of each course consists of the following: a brief description, course length, educational objectives, division of the course (class and shop or lab time), outline of areas covered in class and shop or lab, lists of student objectives, student activities, and teacher activities to develop good student working habits. Other contents may include some or all of the following: a course outline on a daily basis (date, topic, activities, text assignments, methods and aids), an operation sheet for students (objective and activity), a job sheet (tools and equipment, materials, and procedures), a lesson plan, an information sheet, an evaluation (objectives, activity, and information), and a student achievement test. (YLB)

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THE PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE
Pipestone County PAVTI
Pipestone, MN

FIBERGLASS LAMINATION PROGRAM
Course of Instruction

For Adult and Post-Secondary Classes

DEVELOPED BY
Dean Tuin
April 1980

APPROVALS:
Marv Thomsen: Director of Pipestone Area Vocational Technical Institute

CE 036 440

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ACKNOWLEDGMENTS

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The American Institute of Fiberglass Lamination provided much assistance and help with the local Fiberglass Lamination Advisory Committee in establishing elements used in the course. They have furnished the craft committee with much published material on the Fiberglass industry. The Local committee was most helpful in providing the clear thinking necessary for the development of sound learning experiences which would assure the employability of our graduation.

Mr. Marv Thomsen, Director of the Pipestone Vocational Technical Institute; Kathy Thomas, Adult Education Director; and Jim Wakefield, Step Represent tive, provided encouragement, assistance, and support.

They negotiated release time for the Author during the formative stages of the course development. They have all worked on this assignment with enthusiasm and always with a very pleasant attitude toward the task.

Dean Tuin

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

The Philosophy of the Lamination program is to train students for employment and supervisor skills. This is done by the present 11 month program at Pipestone Area Vocational Institute.

In order to train these students for industry you must have a trained instructor. All of our instructors are past Fiberglass Laminators and supervisors. The Fiberglass industry has such a variety of productions that it is hard for one instructor to keep up with all the different varieties. It is our philosophy to return these people to industry as a regular full-time employee, so that they can learn the changes and different ideas in other figerglass industries. Then they can return to the classroom with all of this information to assure that we have an up-to-date program.

OUR OBJECTIVES ARE:

1. Main objectives is to train the students to be employable to meet the local, regional, and state Fiberglass Lamination and Assembly employment and training needs of the industry.

2. In order to get our first objective done correctly it is absolutely necessary that all of our instructors return to industry and learn all new policies and procedures.

UPGRADING POLICY:

1. In order to have an up-to-date program the instructor must return to industry for a minimum of 4 weeks per year. This time is determined by the Department Supervisor and Director of AVTI.

2. Salaries must be paid in accordance with other departments demand that instructor be paid journeyman salary and that there is not any free gratus given to any particular company.

3. Instructor should be paid travel expense by independent school District # 583. Instructor will pay his own room and board.

4. This upgrading policy is designed to meet the employment needs of the fiberglass Lamination industry which in return will be brought back to the students.

2. Have class meet with local plant managers having speak to class.

3. Having meetings with advisory committees.

DEVELOP COOPERATIVE ATTITUDES:

1. Have students participate in group on special work units.

2. Organize students to have them govern themselves as workers might in industry.

3. Assign more advanced students to help students needing assistance.

DEVELOP INDIVIDUAL INITIATIVE AND INDEPENDENCE:

1. Have individuals take "live" work, job and carry them through to completion.

2. Hold students responsible for their work.

3. Have students carefully check each performance step for avlidity.

4. Have each student test work for reliability and accountability.

DEVELOP UNDERSTANDING OF THE OCCUPATIONAL INFORMATION ESSENTIAL TO EMPLOYMENT AS AN APPRENTICE:

1. Student will practice interviewing techniques employed by fiberglass industry.

2. Students will fill in application from for employment

3. Students will read about and report on employment labor-management, social security, retirement plans, and workmens compensation legislation.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

EVALUATING A COURSE OF INSTRUCTION

Explanation of rating scale values:

NA = Not Applicable
0 = Unacceptable or no score
1 = Poor rating
2 = Fair rating
3 = Good rating
4 = Outstanding rating

LESSON INTRODUCTION

--gaining students attentions
--related to past instructor
--relevent to students needs and goods

APPLICATION

--made during presentation
--opportunity for practice
--following presentation

PRESENTATION

--logical order/sequence
--key points identified
--feedback often sought
--student interest maintained
--paced to student's rate
--language level
--availability of needed tools/ equipment/materials

EVALUATION

--immediate measurement following instruction
--plans for later evaluation including when and how, disclosed to students.

OTHER

--no distracting manner
--seek maximum involvement of physical senses
--student involvement in learning

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

GLOSSARY

Accelerator - used in conjunction with a catalyst to produce internal heat in a liquid plastic to cure it.

Acetone - a cleaning fluid used to remove uncured plastic resing from brushes and clothing.

Catalyst - a material which is added to the resin to make it cure more rapidly. This oxidation causes heat, which in turn cures the resin.

Cure - the cross-linking or polymerization of the molecules of the resin. The transformation of the resin from the liquid to the solid state.

Cure Time - the time required for the liquid resin to reach a cure or polymerized state after the catalyst has been added. The time required to reach a point when it is hard enough to sand, that is, not sticky.

Fiberglass - fibers similar to wool or cotton fibers, but made from glass; sometimes called fiberous glass. Many different products are made from these fibers, such as cloth, yarn, mat, mill fibers, chopped strands, roving, woven roving and surfacing mat.

Gelcoat - a thin surface coat, either colored or clear, of properly cured plastic resin which does not contain glass materials. Usually it is cured rapidly by using additional accelerator and catalyst, hence the name gel coat or hot coat.

Lamination - the laying on of layers of glass materials and resin, much like the buildup of plywood.

Layup - placing reinforcing material onto the mold and applying resing to it.

Mold Release - a substance used to coat the mold to prevent the molded laminate from sticking to the mold.

Resin - a liquid plastic substance used to surround glass fibers. It is cured by cross linking its molecules by heating. It is usually thick like honey.

Roving - continuous strands of glass fibers which are grouped together and wound on a spool like untwisted yarn.

Developed by Dean Tuin

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

Course of Instruction for Vocational Mold Prep

For Adult and Post-Secondary Classes

INTRODUCTION

I

The Mold Prep and Assembly Program is designed to meet the employment needs of the Fiberglass Lamination industry. It provides entry level refresher and technical Mold Prep and Assembly skill competency training.

COURSE LENGTH:
11 months - 1272 clock hours
8 months in school
3 months on-the-job-training
6 hours per day - 5 days per week
2 hour class time - 4 hours shop

EDUCATIONAL OBJECTIVES:

1. To provide employment skills in Mold Prep and Assembly for the economically disadvantaged.
2. To provide training for those currently employed in Mold Prep, but find it necessary or desirable to expand or upgrade their skills and knowledge.
3. To meet the local, regional and state Mold Prep and Assembly employment and training needs of the industry.
4. To upgrade the social economic level of the area labor force.
5. To provide the only training available in the state of Minnesota for Mold Prep.

Safety
Inspection
Tools
Materials
Putting on Waxes
Stripping
Cost of Molds
Glaze
Sanding
Summary
Evaluation

Approvals: Marv Thomsen: Director of the Pipestone Area Vocational Technical Institute

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

DIVISION OF COURSE OF MOLD PREP

Phase I	Class Time	two hours per day for 4 weeks
Phase II	Shop or Lab	four hours per day for 4 weeks

STUDENTS ROTATION PLAN

	GROUPS	
WEEKS	CLASS TIME	SHOP OR LAB
4	A	
4		A

CLASS TIME:

1. Layout of course construction
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools Needed
   - e) Materials Needed
   - f) Summary
   - g) Evaluation
2. Shop or Lab Work
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools
   - e) Materials
   - f) Performance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

OBJECTIVES:

You will do the following:

1. State the main steps in Mold Prep in getting a mold ready for gelcoating.
2. Identify all tools and materials that are used in Mold Prep.
3. Know all safety precautions necessary for working in Mold Prep.

ACTIVITY:

1. All information needed will be put on black board, which you will copy for your information.
2. Observe diagnostic techniques and practice the step-by-step Mold Prep procedures.
3. Test Mold Prep by the use of a mold with proper safety equipment.
4. Perform Mold Prep on mold until diagnostic skills are attained.

DEVELOP GOOD WORK HABITS:

1. Provide specific standard for each job. Discuss these with students.
2. Provide a clean, organized workshop that is conductive to good learning.
3. Discuss with students the importance of good work habit in relation to industrial practice, job advancement, etc.
4. Require that all work be tested according to Mold Prep standards.

COORDINATE THE SCHOOL SHOP ACTIVITIES WITH THE TRADE:

1. Arrange a constant visitation schedule with local fiberglass industries.

CLASSIFY THESE WITH MOLD PREP

Safety Precaution

Room Ventilation

Cost of Mold

Inspection

Stripping

Glazing

Waxing

Sanding

Primary advantages of Mold Prep before gelcoating

Materials that are used

Tools

MOLD PREP DEPARTMENT

Course Outline on Daily Basis

Course Mold Prep

Instructor Dean Tuin

Grade Level Adult

Section I

DATE	TOPIC	ACTIVITIES	TEXT ASSIGNMENTS	METHODS AND AIDS
8-4-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	First Aid Projects and Procedures	Moves and Exercises Blackboard and Assignments Learning by Doing
8-5-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	First Aid Projects and Procedures	Moves and Exercises Blackboard and Assignments Learning by Doing
8-6-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	First Aid Projects and Procedures	Moves and Exercises Blackboard and Assignments Learning by Doing
8-7-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	First Aid Projects and Procedures	Moves and Exercises Blackboard and Assignments Learning by Doing
8-8-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	First Aid Projects and Procedures	Moves and Exercises Blackboard and Assignments Learning by Doing

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

NOVEMBER 3, 1980

TITLE: Operations SUBJECT: Mold Prep

FOR THE STUDENTS SERVICE

APPLYING WAXES FOR MOLD PREP:

OBJECTIVES:

At the completion of this lesson you will be able to determine the readiness of molds, use proper tools and materials to correct specifications.

1. Buffer with compound
2. MGM I
3. MGM III
4. MGM X
5. Three times with MGM 16 mold release
6. Cheese cloth
7. Ocar
8. Ram
9. Sandpaper 100-240-320-400-600
10. Ground fiberglass
11. Resin
12. Catalyst

ACTIVITY:

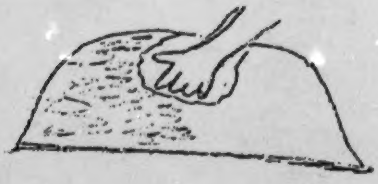
Careful use of materials will result in a superior mold for production. These instructions are intended to help you make the best possible product.

*NOTE: Before Mold Prep things to check:

a) Make sure wheels turn
b) Check for broken pipes
c) Check brakes before operating
d) Check for chips
e) Check for scratches
f) Check for fractures
g) Have all materials ready for use

1. In applying waxes make sure that all film is removed, and wax to a glaze shine. (SEE FIGURE 1*)

(FIGURE 1)



IN APPLYING WAXES:

1. Check molds for broken pipes, brakes, chips, scratches and fractures before starting.
2. Then use compound with buffer, making sure all film has been removed.
3. Then apply the MGM steps 1, 3, 10 and 16 making sure each step is waxed to a glazing shine.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Job Sheet SUBJECT: Mold Prep

COURSE: Beginning Shop Practice

TOOLS:

1. Safety Glasses
2. Buffer
3. Cheese Cloth
4. Chopped Glass
5. Resin
6. Catalyst
7. Sandpaper 100-240-320-400-600

MATERIALS:

1. Compound
2. MGM I
3. MGM III
4. MGM X
5. MGM XVI Mold Release
6. Ram
7. Osar

PROCEDURES:

1. Before starting Mold Prep, check for maintenance on broken pipes, wheels and brakes.

2. Check for chips, scratches, fractures. If found report to your supervisor.

3. When starting Mold Prep, first use compound with buffer, MGM I, -III, -X, and -XVI Mold Release three times.

4. For removing wax buildup use osar, then rewax with MGM XVI three times. Osar each mold on average of every three times running.

5. Ram is used to strip all wax from mold. Whenever using ram be sure to use compound with buffer and the MGM steps. Ram each mold on average of every seven times running.

6. When sanding repair work, use wet sanding starting with 240 and end with 600. Whenever sanding mold, wax with compound with buffer and MGM steps.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Information Topics SUBJECT: Mold Prep

Safety Precautions in using Osar and Ram

Osar and Ram are oxidizing materials. They are usually extremely flammable and may decompose with explosive violence if handled incorrectly. They should be kept away from fire or flame and used in a well ventilated room. They should be stored in a cool, dry place.

Epoxy curing agents will produce chemical burns if they come in direct contact with the skin. They can develop skin irritations, and even dermatitis in extreme cases. The danger is slight when these materials are used properly and in small quantities, never the less, the danger remains.

When adding Osar and Ram, care should be taken to follow the manufacturers recommendations exactly. When using materials, make sure that safety glasses, respirators and rubber gloves are used.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

EVALUATION

OBJECTIVE:

You will do the following:

1. At the completion of this lesson you will be able to determine the readiness of molds, use proper tools and materials to correct specifications.

2. How lesson will be conducted.

ACTIVITY:

1. Read the information given to you in class with the library research lesson.

2. Take a sheet of paper and divide it equally into three columns, the heading for the first column should be ON THE JOB SAFETY EQUIPMENT; the second column should be SUPPLIES; the third column should be INSPECTION OF MOLD PREP.

3. Turn to your research lesson and look at the list of goods. Group each of the goods into one of the three categories.

4. Give reasons why these steps are so important in a good finish product.

5. Turn your answer sheet into the instructor.

Information about Mold Prep

Manufacturers produce many different types of goods for use. Regardless of what type of goods are produced, they all have to use the same basic groups: on the job safety, supplies and inspection of mold prep.

On the job safety - generally speaking Ram and Osar are safe for the average person to handle if certain precautions are taken. Safety is important in all phases of shop work and it is no less important in the use of Ram and Osar. Learn the rules of safety and establish safe work habits. A safe worker has respect for the tools, equipment and materials with which he works. The safety precautions taken are the use of respirators, safety glasses, room ventilation, protecting the skin and the handling of curing agents.

Supplies - that will be used by the manufacturers that you will have to know and operate include compound, MGM I, -III, -X, -XVI.

Inspection of Mold Prep - recommended by the manufacturers, that a person will have to know how to check for chips, scratches and fractures.

Classify these goods into the three categories

Chips

MGM-I

Scratches

Safety Glasses

Respirators

MGM-III

Broken Pipes

MGM XVI Mold Release

Wheels

Cheese Cloth

MGM-X

Chopped Glass

Resin

Catalyst

Ram

Osar

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

STUDENT ACHIEVEMENT TEST

Complete the following statements by writing in the words.

1. Describe five materials used in waxing a mold.

   a)
   b)
   c)
   d)
   e)

2. List three safety precautions in working with mold prep.

   a)
   b)
   c)

3. List six inspections needed before starting waxing.

   a)
   b)
   c)
   d)
   e)
   f)

4. Why strip a mold? ________________________________

Circle the "T" in front of the statement if it is correct;
circle the "F" in front of the statement if it is not correct.

T F 5. The first step in waxing of a mold is to use MGM 1.

T F 6. Ram is used for stripping wax back to the mold.

T F 7. When mixing chopped glass, always mix resin and catalyst together first before adding chopped glass.

T F 8. Whenever sand paper is used on a mold, it is a must to go through all the wax steps.

T F 9. Osar is used for stripping wax back to the mold.

Multiple Choice - Mark the one you think answers the question.

10. Ram and Osar are what kind of material?

___a) Oxidizing
___b) Accelerator
___c) Resin
___d) None of the above

11. Curing time for mold prep is

___a) three to four hours.
___b) ten to twelve hours.
___c) one to two hours.
___d) none of the above.

12. When sanding the last paper to use is

___a) 60 sandpaper.
___b) 100 sandpaper.
___c) 400 sandpaper.
___d) none of the above.

13. When waxing the first step is

___a) MGM I.
___b) compound with buffer.
___c) MGM X.
___d) none of the above.

14. Whenever sandpaper is used on a mold,

___a) use all wax steps.
___b) gelcoat.
___c) mold release.
___d) none of the above.

Essay

15. Write an essay on why mold prep is so important.

THE PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

Pipestone County PAVTI

Pipestone, MN

Course of Instruction for Vocational Gelcoating

For Adult and Post-Secondary Classes

DEVELOPED BY

Dean Tuin

November 1980

APPROVALS:

Marv Thomsen: Director of Pipestone Area
Vocational Technical Institute

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

INTRODUCTION

I

The Gelcoating and Assembly Program is designed to meet the employment needs of the fiberglass lamination industry. It provides entry level refresher and technical Gelcoating and Assembly skills competency training.

COURSE LENGTH:	11 months - 1272 clock hours 8 months in school 3 months on-the-job-training 6 hours per day - 5 days per week 2 hours class time - 4 hours shop

EDUCATIONAL OBJECTIVES:

1. To provide employment skills in gelcoating and assembly for the economically disadvantaged.

2. To provide training for those currently employed in gelcoating, but find it necessary or desirable to expand or upgrade their skills and knowledge.

3. To meet the local, regional and state gelcoating and assembly employment and training needs of the industry.

4. To upgrade the social economic level of the area labor force.

5. To provide the only training available in the state of Minnesota for gelcoating.

Safety
Inspection
Tools
Materials
Applying Gelcoat
Mill Guage
Paint Lines
Pulling Tape
Spraying Lines
Summary
Evaluation

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

DIVISION OF COURSE OF GELCOATING

Phase I	Class Time	two hours per day for 4 weeks
Phase II	Shop or Lab	Four hours per day for 3 weeks
Phase III	Operation of Spray Gun	Four hours per day for 1 week

STUDENTS ROTATION PLAN

	GROUPS		
WEEKS	CLASS TIME	SHOP OR LAB	SPRAY GUN
3	A		
4		A	
1			A

CLASS TIME:

1. Layout of course construction
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools Needed
   - e) Materials Needed
   - f) Summary
   - g) Evaluation
2. Shop or Lab Work
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools
   - e) Materials
   - f) Performance

3. Operation of Spray Gun

a) Supplies
b) Explain Basic Function
c) Explain Basic Breakdown
d) Reassemble
e) How to set up for Spraying
f) Adjustment
g) Cleaning
h) Summary
i) Performance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

OBJECTIVES:

You will do the following:

1. State main steps in gelcoating.
2. Identify all tools and materials that are used in gelcoating.
3. Know all safety precautions necessary for working in gelcoating.

ACTIVITY:

1. All information needed will be put on blackboard, which you will copy for your information.
2. Observe diagnostic techniques and practice the step-by-step gelcoating procedures.
3. Test gelcoating by the use of mill guage with proper safety equipment.
4. Perform gelcoating on mold until diagnostic skills are attained.

DEVELOP GOOD WORK HABITS:

1. Provide specific standard for each job. Discuss these with students.
2. Provide a clean, organized workshop that is conductive to good learning.
3. Discuss with students the importance of good work habits in relation to industrial practice, job advancement, etc.
4. Require that all work be tested in accordance with gelcoating standards.

COORDINATE THE SCHOOL SHOP ACTIVITIES WITH THE TRADE:

1. Arrange a constant visitation schedule with local fiberglass industries.

CLASSIFY THESE WITH GELCOATING

Safety Precaution

Room Ventilation

Applying Gelcoat

Inspection

Applying Tape

Using Mill Guage

Painting Lines

Pulling Tape

Spraying Line

Materials that are used

Tools

GELCOATING DEPARTMENT

Course Outline on Daily Basis

Course Gelcoating

Instructor Dean Twin

Grade Level Adult

Section 2

DATE	TOPIC	ACTIVITIES	TEXT ASSIGNMENTS	METHODS AND AIDS
9-1-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
9-2-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
9-3-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
9-4-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
9-5-81	Safety Mold Prep Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Operation SUBJECT: Gelcoating

FOR THE STUDENTS SERVICE

APPLYING GELCOAT:

OBJECTIVES:

At completion of this lesson you will be able to determine readiness of molds, use of proper equipment to correct specification.

1. Gelcoat
2. Catalyst
3. Mill Guage
4. Spray Gun

ACTIVITY:

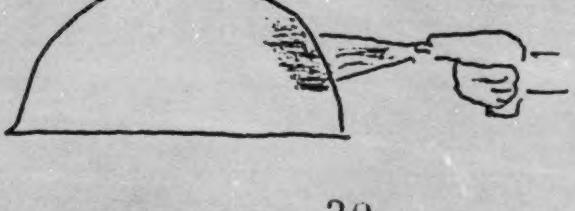
Careful use of materials will result in a superior paint job for production. These instructions are intended to help you make the best possible product.

*NOTE: Before Gelcoating things to check:

a) Wipe mold with cheese cloth to be sure it is dust free.
b) Check catalyst setting.
c) Check for color contamination.
d) Make sure there is enough gelcoat to finish project.
e) Use cardboard to spray on before spraying mold.

1. In applying gelcoat, hold gun 18 inches away from mold. (SEE FIGURE 1*)

(FIGURE 1)



IN APPLYING GELCOAT:

1. Avoid spraying raw catalyst onto the mold.
2. Make sure that both catalyst and gelcoat are mixed "throughly".
3. Hold gun at least 18 inches from mold.
4. Hold gun at a 90 degree angle.
5. When spraying make sure to spray in uniformly.
6. Apply between 14 to 18 mills.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Operations

SUBJECT: Gelcoating

COURSE: Beginning Shop Practice

TOOLS AND EQUIPMENT:

1. Respirators
2. Safety Glasses
3. Steel Toe Shoes
4. Hard Hats
5. Mill Guage
6. Spray Gun
7. Cheese Cloth

MATERIALS:

1. Gelcoat
2. Catalyst
3. Acetone

PROCEDURE:

1. Before starting gelcoating, wipe mold to be sure it is dust free.
2. Check for catalyst setting to make sure that setting is 2%.
3. Operate spray gun on cardboard to make sure there is no color contamination and that catalyst is coming through.
4. Avoid raw catalyst on mold.
5. Hold gun 18 inches from mold.
6. Hold gun at a 90 degree angle to mold.
7. Make sure spray is uniform.
8. Run gelcoat 14 to 18 mills, about cardboard thick.
9. Make sure gun is cleaned good with acetone.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Information Topics SUBJECT: Gelcoating

Safety Precautions in Using Gelcoat, Catalyst and Acetone

Gelcoat, catalyst and acetone are oxidizing materials. They are usually extremely flammable and may decompose with explosive violence if handled incorrectly. They should be kept away from fire or flame and used in a well ventilated room. They should be stored in a cool dry place.

Epoxy curing agents will produce chemical burns if they come in direct contact with the skin. They can develop skin irritations, and even dermatitis in extreme cases. The danger is slight when these materials are used properly and in small quantities, never the less, the danger remains. When adding catalyst to gelcoat or using acetone, care should be taken to follow the manufacturers recommendations exactly. When using materials, make sure that safety glasses, respirators and rubber gloves are used.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

EVALUATION

OBJECTIVE:

You will do the following:

1. At completion of this lesson you will be able to determine readiness of molds, use proper equipment to correct specifications.
2. How lesson will be conducted.

ACTIVITY:

1. Read the information given to you in class, with the library research lessons.
2. Take a sheet of paper and divide it equally into three columns, the heading for the first column should be On the Job Safety Equipment; second column should be Supplies; third column should be Inspection of Gelcoat.
3. Turn to your research lesson and look at the first list of goods. Group each of the goods into one of the three categories.
4. Give reasons why these steps are so important in a good finish product.
5. Turn your answer sheet into the instructor.

Information about Gelcoating

Manfacturers produce many different types of goods for use. But regardless of what type of goods are produced, they all have to use the same basic groups: on the job safety, supplies, and inspections of gelcoat.

On the job safety - generally speaking gelcoat, catalyst and acetone are safe for the average person to handle if certain precautions are taken. Safety is important in all phases of shop work, and it is no less important in using gelcoat, catalyst and acetone. Learn the rules of safety and establish safe working habits. A safe worker has respect for the tools, equipment and materials with which he works. The safety precautions taken are the use of respirators, safety glasses, room ventilation, protecting the skin and the handling of curing agents.

Supplies - that will be used by the manufacturers that you will have to know and operate include gelcoat gun, mill guage, gelcoat, catalyst and cheese cloth.

Inspection of gelcoat - recommended by the manufacturers, that a person will have to know how to check for catalyst setting, color contamination, avoid raw catalyst, catalyst and gelcoat are mixed, hold gun 18 inches at 90 degree angle to mold, uniformed and 14 to 18 mills.

Classify these goods into the three categories

Spray Gun

Catalyst

Mill Guage

Respirators

Cheese Cloth

Safety Glasses

Gelcoat

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

STUDENT ACHIEVEMENT TEST

Complete the following statements by writing in the words.

1. Describe three materials used in gelcoating.

   a)
   b)
   c)

2. List three safety precautions in working with gelcoating.

   a)
   b)
   c)

3. List five inspections needed before starting gelcoating.

   a)
   b)
   c)
   d)
   e)

4. Why spray gelcoat on cardboard? ____________________________

Circle the "T" in front of the statement if it is correct.
Circle the "F" in front of the statement if it is not correct.

T F 5. In spraying the tape line, spray first side first and second side last.

T F 6. In pulling tape, allow it to tack.

T F 7. Checking of gelcoat should have 30 to 35 mills.

T F 8. For inspection of gelcoat, spray on mold.

T F 9. Hold spray gun 18 inches from mold.

Multiple Choice - Mark the one you think answers the question.

10. Gelcoat, catalyst and acetone are what kind of materials?

    a) Oxidizing
    b) Roving
    c) Cloth
    d) None of the above

11. Curing time for gelcoat is

    a) six to seven hours.
    b) ten to twelve hours.
    c) one to two hours.
    d) none of the above.

12. Checking of gelcoat should be

    a) 22 to 24 mills.
    b) 14 to 18 mills.
    c) 30 to 35 mills.
    d) none of the above.

13. Hold spray gun _________ from mold.

    a) 18 inches
    b) 36 inches
    c) 25 inches
    d) none of the above

14. Hold spray gun at

    a) 75 degree angle to mold.
    b) 35 degree angle to mold.
    c) 65 degree angle to mold.
    d) none of the above.

Essay

15. Write an essay on why gelcoating is so important.

THE PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

Pipestone County PAVTI

Pipestone, MN

Course of Instruction for Vocational Fiberglass Lamination

For Adult and Post-Secondary Classes

DEVELOPED BY

Dean Tuin

February 1980

APPROVALS:

Jim Wakefield: Step Representatives
County Director of
Vocational
Technical Education

Marv Thomsen: Director of Pipestone Area
Vocational Technical Institute

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

INTRODUCTION

I

The Fiberglass Lamination and Assembly Program is designed to meet the employment needs of the Fiberglass Lamination industry. It provides entry level refresher and Technical Fiberglass Lamination and Assembly skill competency training.

COURSE LENGTH:
6 months - 720 Clock hours
3 months in school
3 months on-the-Job-Training
6 hours per day - 5 days per week.
2 hour class time - 4 hours shop.

EDUCATIONAL OBJECTIVES:

1. To provide employment skills in Fiberglass Lamination and Assembly for the economically disadvantaged.

2. To provide training for those currently employed in Fiberglass Lamination, but find it necessary or desirable to expand or upgrade thier skills and knowledge.

3. To meet the local, regional and state Fiberglass Lamination and Assembly employment and training needs of the industry.

4. To upgrade the social economic level of the area labor force.

5. To provide the only training available in the state of Minnesota for Fiberglass Lamination.

Safety
Inspection
Tools
Materials
Chop Parts
Putting on woven Roving
Squeegy and Rolling
Checking for air
Hand and/or manual Lamination technique
Evaluation

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

DIVISION OF COURSE OF FIBERGLASS LAMINATION

Phase I Class Time . . . . two hours per day for 4 weeks.

Phase II Shop or Lab . . . . four hours per day for 4 weeks.

Phase III Operation of Choppergun. . . . . four hours per day for 2 weeks.

STUDENTS ROTATION PLAN

WEEKS	GROUPS		
	CLASS TIME	SHOP OR LAB	CHOPPER GUN
1-2	A		
3-6		A	
7-12		A	A

CLASS TIME:

1. Layout of course construction
    - a) Job Safety
    - b) Supplies
    - c) Inspection
    - d) Tools needed
    - e) Materials Needed
    - f) Summary
    - g) Evaluation
2. Shop or Lab Work
    - a) Job Safety
    - b) Supplies

c) Inspection
d) Tools
e) Materials
f) Performance

3. Operation of Chopper Gun

a) Supplies
b) Explain basic function
c) Explain basic breakdown
d) Reassemble
e) How to set up for chopping
f) Putting rollers in
g) Putting blades in
h) Adjustment
i) Cleaning
j) Summary
k) Preformance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

OBJECTIVES:

You will do the following:

1. State the main steps in the lamination of a fiberglass product from the mold.
2. Identify all tools and materials that are used in lamination.
3. Know all safety precautions necessary for working with fiberglass materials.

ACTIVITY:

1. All information needed will be put on black board, which you will copy for your information.
2. Observe diagnostic techniques and practice the step-by-step Lamination procedures.
3. Test lamination materials at the test bench with proper safety equipment.
4. Perform fiberglass materials on practice forms until diagnostic skills are attained.

DEVELOP GOOD WORK HABITS:

1. Provide specific standard for each job. Discuss these with students.
2. Provide a clean, organized workshop that is conductive to good learning.
3. Discuss with students the importance of good work habit in relation to industrial practice, job advancement etc.
4. Require that all work be tested according to lamination standards.

COORDINATE THE SCHOOL SHOP ACTIVITIES WITH THE TRADE:

1. Arrange a constant visitation schedule with local fiberglass industries.

CLASSIFY THESE WITH FIBERGLASS LAMINATION

Safety Precautions

Room Ventilation

Handling Curing Agent

Protecting the Shine

Strength of Materials

Primary Advantages of Fiberglass Over Other Production Materials

Materials that are Used

Tools

FIBERGLASS LAMINATION DEPARTMENT

Course Lamination

Course Outline on Daily Basis

Instructor Dean Tuin

Grade Level Adult

Section 3

DATE	TOPIC	ACTITIVITES	TEXT ASSIGNMENTS	METHODS AND AIDS
10-11-81	Safety Lamination Labor Shop	Class Time Class Time Lab Time	First Aide and C.P.R. Projects and Procedures	Moves and Excercise Blackboard and Assignments Learning by doing
10-12-81	Safety Lamination Labor Shop	Class Time Class Time Lab Time	First Aide and C.P.R. Projects and Procedures	Moves and Excercise Blackboard and Assignments Learning by doing
10-13-81	Safety Lamination Labor Shop	Class Time Class Time Lab Time	First Aide and C.P.R. Projects and Procedures	Moves and Excercise Blackboard and Assignments Learning by doing
10-14-81	Safety Lamination Labor Shop	Class Time Class Time Lab Time	First Aide and C.P.R. Projects and Procedures	Moves and Excercise Blackboard and Assignments Learning by doing
10-15-81	Safety Lamination Labor Shop	Class Time Class Time Lab Time	First Aide and C.P.R. Projects and Procedures	Moves and Excercise Blackboard and Assignments Learning by doing

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

TITLE: Operations SUBJECT: Lamination

FOR THE STUDENTS SERVICE

APPLYING FIBERGLASS LAY UP:

OBJECTIVE:

At the completion of this lesson you will be able to operate all relevent equipment, tools and produce an air-free part to correct specifications.

1. Resin
2. Catalyst
3. Acetone
4. Rollers
5. Paint brush
6. Scissors
7. Fiberglass mat
8. Trim knife

ACTIVITY:

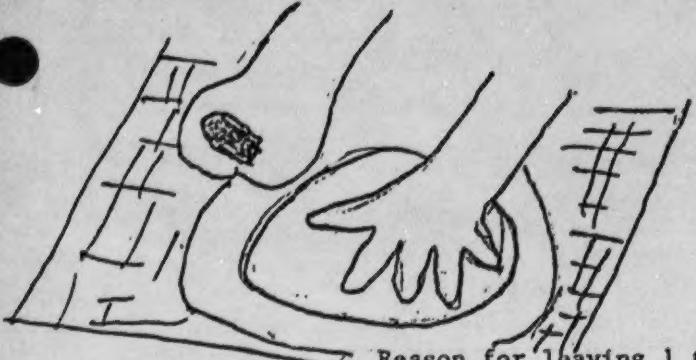
Careful use of materials will result in a superior fiberglass laminator. These instructions are intended to help you make the best possible product.

*NOTE: Before laminating things to check:

a) Make sure gelcoat is cured
b) Check for lifted gel coat
c) Check for alligation
d) Cut all fiberglass materials ahead of time and have all materials laid out ready for use.
e) Have all tools checked to make sure of proper working order.

1. Cutting of the fiberglass mat make sure that you leave at least 1 to 2 inches more then the size of mold. (SEE FIGURE 1 *)

*CUTTING OF MAT



(FIGURE I)

2. Reason for leaving 1 to 2 inches is to allow for shrinkage when in curing or drying form.

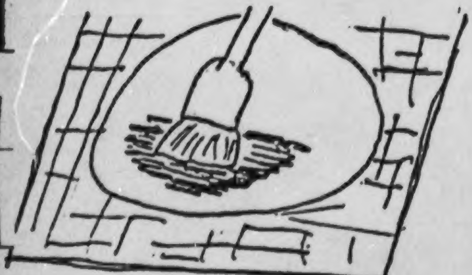
Mixing of Resin and Catalyst

1. Resin and Catalyst should be mixed just before use. This will prevent its curing before it is applied to the mold.

2. Measure out one ounce of resin for each square foot of mold area to be covered with this coat. Add 2% Catalyst (at least 6 drops per ounce of resin).

3. After resin and Catalyst are mixed, use paint brush, and soak down both sides of fiberglass mat. (SEE FIGURE 2 **)

**SOAKING OF MAT

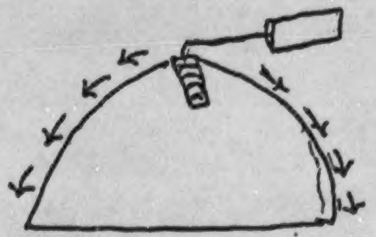


(FIGURE 2)

4. Work out all air at this time by the use of a Lamination Roller

5. Start at the peak of the mold and drive the air down to an escape root. (SEE FIGURE 3 ***)

*** (FIGURE 3)



6. Use Acetone to clean all tools and hands
7. Let cure until tacky enough to trim off excess materials.
8. Let cure for eight hours before popping.

LESSON PLAN

DATE January 15, 1979 CODE ______ TASK NO. 04

SUBJECT Lamination

OBJECTIVE At the completion of this lesson you will be able to operate all relevent equipment, tools and produce an air-free part to correct specifications.

Teaching Aide Equipment	Visual Aide Number	On the Job Safety Equipment	Machine and Attachment	Supplies
1	1	1 Respirators	1	1 Rollers
2	2	2 Safety glasses	2	2 Squeegy
3	3	3	3	3 Scissors
4	4	4	4	4 Fiberglass Mat
5	5	5	5	5 Woven Roving
6	6	6	6	6 Utility Knife
				7 Corner Roller
				8 Catalyst
				9 Resin
				10 met or twine
				11 paint brushes

APPLICATION

TEACHING STEPS KEY POINTS TO SAY OR DO

LESSON INTRODUCTION: State Objective - How lesson will be conducted

LESSON PRESENTATION:

OUTLINE:

Inspection of Gelcoat

1. Make sure paint cured
2. Check for lifted gel
   a. Cause
3. Check for alligation
   a. Cause (picture)

Tools

1. Show all tools
2. How to Use

Materials

Explain Different Types

1. Mat
2. Roving
3. Cloth
4. Resins
5. Catalyst

TEACHING STEPS KEY POINTS TO SAY OR DO

CHOP PARTS

1. Explain
2. Show How
3. Explain Saturation

PUT ROVING

1. Why Roving
2. Show How
3. Wetting Out

SQUEEGY & ROLLING

1. Explain the Use
2. Show how they are used
3. Where to use

CHECK FOR AIR

1. Why look for air
2. What it is
3. How to get it out
4. Why get it out

SUMMARY

A. Restate Objective
B. Review Techniques
C. Questions and Answer

EVALUATION

A. Performance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

TITLE: Job Sheet SUBJECT: Lamination

COURSE: Beginning Shop Practice

TOOLS AND EQUIPMENT

1. Respirators
2. Safety Glasses
3. Rollers
4. Squeegy
5. Scissors
6. Coth Mat
7. Roving Woven
8. Utility Knife
9. Corner Rollers
10. Paint Brushes

MATERIAL:

1. Fiberglass Mat
2. Resin
3. Catalyst

PROCEDURE:

1. Mix about eight ounces of resin with 32 to 48 drops of Catalyst.
2. If the humidity is not 50% and temperature is not between 72 and 74° variations in the amount of catalyst may be necessary.
3. Brush resin and Catalyst mixed on to the surface.
4. Add the fiberglass mat. (2oz per suare foot) it should be 1 or 2 inches larger than the mold in dimensions.
5. Brush on a coat of resin, do not get to wet.
6. Using lamination roller work out all the air bubbles, and completely saturating the fiberglass mat.
7. Let set and trim with utility knife.

FIRBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

TITLE: Information Topics SUBJECT: Lamination

Safety precautions in mixing resin, and handling curing agents

Catalyst for polyester resin are oxidizing materials. They are usually extremely flammable and may decompose with explosive violance if handled incorrectly. They should be kept away from fire or flame and used in a well-ventilated room. They should be stored in a cool, dry place.

Eposy curing agents will produce chemial burns if they come in direct contact with the skin. They can develop skin irritation, and even dermatitis (not likely with polyester) in extreme cases. The danger is slight when these materials are used properly and in small quanities, never the less the danger remains.

When adding catalyst to the resin care should be taken to follow the manufacture recommendation excatly. Some resin use catalyst which are in two parts. Part one is usually an accelerator and Part two is generally called a catalyst. These two chemicals if mixed directly together can rapidly decompose or explode. Be sure to mix these parts into the resin separately, mix the resin and accelerator thoroughly before adding and mixing the catalyst.

In the resin which have only one catalyst, the accelerator has been added to the resin at the factory. This eliminates, the need for special caution during this operation.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

EVALUATION

OBJECTIVE:

You will do the following:

1. At the completion of this lesson you will be able to operate all relevent equipment, tools and produce an air-free part to correct specification.
2. How lesson will be conducted

ACTIVITY:

1. Read the information given to you in class, with the library research lessons.
2. Take a sheet of paper and divide it equally into three columns, the heading for the first column should be ON THE JOB SAFETY EQUIPMENT; second column should be SUPPLIES; third column should be INSPECTION OF GEL COAT.
3. Turn to your research lesson and look at the list of goods. Group each goods into one of the three categories.
4. Name products that are made from fiberglass in your community.
5. Turn your answer sheet into the instructor.

Information about Fiberglass Lamination

Manufactures produce many different types of goods for use. But regardless of what type of goods are produced, they all have to use the same basic groups: on the job safety, supplies, and inspections of gelcoat.

On the job safety, generally speaking fiberglass plastic materials are safe for the average person to handle if certain precautions are taken. Safety is important in all phases of shop work, and it is no less important in using fiberglass. Learn the rules of safety and establish safe working habits. A safe worker has respect for the tools, equipment, and materials with which he works. The safety precautions taken are the use of respirators, safety glasses, room ventilation, protecting the skin, and the handling of curing agents.

Supplies - that will be used by the manufacturers that you will have to know and operate, rollers, squeegies, scissors, utility knives, corner rollers

Catalyst, resin, fiberglass mat, acetine, and paint brushes.

Inspection of gelcoating - recommended by the manufactures, that a person will have to know how to check for lifted gelcoat, making sure that gelcoat is cured, and checking for alligation.

Classify these goods into the three categories:

ALLIGATION

ROLLERS

FIBERGLASS MAT

SCISSORS

LIFTED GELCOAT

RESPIRATORS

PAINT BRUSH

RESIN

UTILITY KNIFE

SAFETY GLASS

CORNER ROLLER

CATALYST

WOVEN ROVEN

SQUEEGY

ACETONE

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

STUDENT ACHIEVEMENT TEST

Complete the following statements by writing in the words.

1. Describe five materials used for Lamination.

   a)
   b)
   c)
   d)
   e)

2. List five safety precautions in handling curing agents.

   a)
   b)
   c)
   d)
   e)

3. List ten tools and equipment used for lamination.

   a)
   b)
   c)
   d)
   e)
   f)
   g)
   h)
   i)
   j)

4. What is Acetone used for________________ _______________.

Circle the "T" in front of the statement if it is correct; circle the "F" if the statement is not correct.

T F 5. Mix about eight ounces of resin with 12 drops of catalyst.

T F 6. For best results, the room humidity should be 50%.

T F 7. For best results, the room temperature should be 85°.

T F 8. Adding Fiberglass Mat, use 6 ounces per square foot.

T F 9. Lamination rollers are used to check the thickness of fiberglass.

MULTIPLE CHOICE - Mark the one you think answers the question.

10. Epoxy curing agents will produce what degree of burns?

___a) First degree
___b) Second degree
___c) Third degree

11. Catalyst for polyester resin are what kind of materials?

___a) Oxidizing
___b) Accelerator
___c) Craging
___d) None of the above

12. Curing time for Fiberglass Mat is . . . .

___a) three to four hours.
___b) one to two hours.
___c) ten to twelve hours.
___d) none of the above.

13. Some resin use catalyst which are in two parts, one is a catalyst the other is a . . . .

___a) surfacing agent.
___b) thinner.
___c) accelerator.
___d) none of the above.

14. Air in the room should be changed at least once every . . . .

___a) hour.
___b) five minutes.
___c) twenty minutes.
___d) none of the above.

ESSAY - 15. Write an essay on how fiberglass compares with other materials.

THE PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

Pipestone County PAVTI

Pipestone, MN

Course of Instruction for Vocational Stiffening
For Adult and Post-Secondary Classes

DEVELOPED BY

Dean Tuin

November 1980

APPROVALS:

Marv Thomsen: Director of Pipestone Area
Vocational-Technical Institute

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

INTRODUCTION

I

The stiffening and assembly program is designed to meet the employment needs of the fiberglass lamination industry. It provides refresher, entry level and technical Stiffening and Assembly skills competency training.

COURSE LENGTH:	11 months - 1272 clock hours
	8 months in school
	3 months on-the-job-training
	6 hours per day, 5 days per week
	2 hours class time, 4 hours shop

EDUCATIONAL OBJECTIVES:

1. To provide employment skills in stiffening and assembly for the economically disadvantaged.
2. To provide training for those currently employed in stiffening, but find it necessary or desirable to expand or upgrade their skills and knowledge.
3. To meet the local, regional and state stiffening and assembly employment and training needs of the industry.
4. To upgrade the social economic level of the area labor force.
5. To provide the only training available in the state of Minnesota for stiffening.

Safety
Inspection
Tools
Materials
Applying Wood
Applying Gelcoat
Applying Weights
Applying Clamps

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

DIVISION OF COURSE OF STIFFENING

Phase I	Class Time	two hours per day for 4 weeks
Phase II	Shop or Lab	four hours per day for 4 weeks

STUDENTS ROTATION PLAN

	GROUPS	
WEEKS	CLASS TIME	SHOP OR LAB
4	A	
		A

CLASS TIME:

1. Layout of course construction
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools Needed
   - e) Materials Needed
   - f) Summary
   - g) Evaluation
2. Shop or Lab Work
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools
   - e) Materials
   - f) Performance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

OBJECTIVES:

You will do the following:

1. State the main steps in stiffening.

2. Identify all tools and materials that are used in stiffening.

3. Know all safety precautions necessary for working in stiffening.

ACTIVITY:

1. All information needed will be put on blackboard, which you will copy for your information.

2. Observe diagnostic techniques and practice the step-by-step- stiffening procedures.

3. Test stiffening by the use of diagrams, with proper safety equipment.

4. Perform stiffening on mold until diagnostic skills are attained.

DEVELOP GOOD WORK HABITS:

1. Provide specific standards for each job. Discuss these with students.

2. Provide a clean, organized workshop that is conductive to good learning.

3. Discuss with students the importance of good work habits in relation to industrial practice, job advancement, etc.

4. Require that all work be tested according to stiffening standards.

COORDINATE THE SCHOOL SHOP ACTIVITIES WITH THE TRADE:

1. Arrange a constant visitation schedule with local fiberglass industries.

CLASSIFY THESE WITH STIFFENING

Safety Precaution

Room Ventilation

Applying Glass

Inspection

Applying Wood

Chopper Gun

Materials that are used

Applying Weights

Applying Clamps

Tools

STIFFENING DEPARTMENT

Course Outline on Daily Basis

Course Stiffening   Instructor [illegible]

Grade Level Adult   Section 4

DATE	TOPIC	ACTIVITIES	TEXT ASSIGNMENTS	METHODS AND AIDS
11-3-81	Safety Stiffen Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
11-4-81	Safety Stiffen Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
11-5-81	Safety Stiffen Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
11-6-81	Safety Stiffen Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
11-7-81	Safety Stiffen Labor Shop	Class Time Class Time Lab Time	Safety Projects	Exercise Blackboard and Assignments Learning by Doing

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Operation SUBJECT: Stiffen

FOR THE STUDENTS SERVICE

APPLYING STIFFENING:

OBJECTIVES:

At the completion of this lesson you will have the basic knowledge for the use of stiffening and how to apply it to correct specifications.

1. Applying Wood
2. Weights
3. Chopper Gun
4. Rollers
5. Radius Rollers
6. Paint Brush
7. Tape Measure

ACTIVITY:

Careful use of materials will result in a superior stiffening job for production. These instructions are intended to help you make the best possible product.

*NOTE: Before Stiffening things to check:

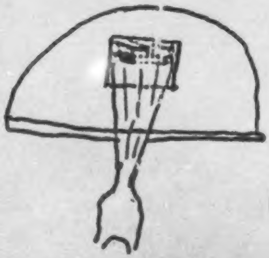
a) Make sure lamination is cured.
   1) Touch to make sure.
   2) If tacky wait.

b) Have all needed materials.
   1) Correct wood parts.
   2) Weights
   3) Catalyst
   4) Gun running properly

c) Before applying glass check diagram.

1. In applying stiffen glass where wood will be placed only. (SEE FIGURE 1*)

(FIGURE 1)



IN APPLYING STIFFEN:

1. Apply 3 to 4 oz evenly.
2. Make sure you have enough glass to cover this area.
3. Place correct wood in correct place.
   a) check diagram.
4. Apply weights.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Job Sheet SUBJECT: Stiffen

COURSE: Beginning Shop Practice

TOOLS AND EQUIPMENT:

1. Respirators
2. Safety Glasses
3. Steel Toe Shoes
4. Chopper Gun
5. Roller
6. Radius Roller
7. Paint Brush
8. Wood
9. Weights
10. Acetone
11. Tape Measure

MATERIALS:

1. Fiberglass
2. Catalyst
3. Wood
4. Weights
5. Acetone

PROCEDURES:

1. Before starting stiffen, check diagram.

2. Check for catalyst setting to be sure that setting is 2%.

3. Operate chopper gun on cardboard to make sure everything is working.

4. Apply glass where wood will be placed only.

5. Apply 3 to 4 oz evenly.

6. Place wood, apply glass just around the edges with resin over the rest of the wood.

7. Roll glass around edges getting all the air out and brush down smooth.

8. Make sure chopper gun is cleaned with acetone.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Information Topics SUBJECT: Stiffen

Safety Precautions in Using Resin, Catalyst and Acetone

Resin, catalyst and acetone are oxidizing materials. They are usually extremely flammable and may decompose with explosive violence if handled incorrectly. They should be kept away from fire or flame and used in a well ventilated room. They should be stored in a cool, dry place.

Epoxy curing agents will produce chemical burns if they come in direct contact with the skin. They can develop skin irritations, and even dermatitis in extreme cases. The danger is slight when these materials are used properly and in small quantities, never the less, the danger remains.

When adding catalyst to fiberglass or using acetone care should be taken to follow the manufacturers recommendations exactly. When using materials, make sure that safety glasses, respirators and rubber gloves are used.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

EVALUATION

OBJECTIVES:

You will do the following:

1. At completion of this lesson you will be able to determine readiness of lamination and know the use of proper equipment to correct specifications.

2. How lesson will be conducted.

ACTIVITY:

1. Read the information given to you in class, with the library research lesson.

2. Take a sheet of paper and divide it equally into three columns, the heading for the first column should be On The Job Safety Equipment; second column should be Supplies; third column should be Inspection of Stiffening.

3. Turn to your research lesson and look at the list of goods. Group each of the goods into one of the three categories.

4. Give reasons why these steps are so important in a good finish product.

5. Turn your answer sheet into the instructor.

Information about Stiffening

Manufacturers produce many different types of goods for use. But regardless of what type of goods are produced, they all have to use the same basic groups: on the job safety, supplies and inspection of stiffen.

On the job safety - generally speaking resin, catalyst and acetone are safe for the average person to handle, if certain precautions are taken. Safety is important in all phases of shop work, and it is no less important in using resin, catalyst and acetone. Learn the rules of safety and establish safe working habits. A safe worker has respect for the tools, equipment and materials with which he works. The safety precautions taken are the use of respirators, safety glasses, room ventilation, protecting the skin and the handling of curing agents.

Supplies - that will be used by the manufacturer that you will have to know and operate include the chopper gun, roller, tape measure and radius roller.

Inspection of stiffen - recommended by the manufacturers, that a person will have to know how to check for catalyst setting, applying glass, applying wood, applying weights and clamps and using a tape measure.

Classify these goods into the three categories

Chopper Gun

Catalyst

Resin

Acetone

Respirators

Wood

Safety Glasses

Weights

Clamps

Glass

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

STUDENT ACHIEVEMENT TEST

Complete the following statements by writing in the words.

1. Describe five materials used in stiffen.
   a)
   b)
   c)
   d)
   e)
2. List three safety precautions in working with stiffen.
   a)
   b)
   c)
3. List three inspections needed before starting stiffening.
   a)
   b)
   c)
4. Why spray chop on cardboard before starting product? ______________________________

Circle the "T" in front of the statement if it is correct.
Circle the "F" in front of the statement if it is not correct.

T F 5. Always chop over laminated area first, before getting needed materials.

T F 6. Always make sure you have enough glass to cover this area.

T F 7. When applying glass chop between 6 to 8 oz evenly.

T F 8. When applying stiffening make sure to chop a lot larger area than the board will cover.

T F 9. Whenever using chopper gun always have your safety glasses and respirator on.

Multiple Choice - mark the one you think answers the question.

10. Resin, catalyst and acetone are what kind of materials?

    a) accelerator
    b) color pigment
    c) oxidizing
    d) none of the above

11. When applying glass, chop between

    a) 6 to 8 oz.
    b) 3 to 4 oz.
    c) 10 to 12 oz.
    d) none of the above.

12. Before applying glass check

    a) gelcoating.
    b) mold prep.
    c) your watch.
    d) none of the above.

13. Before operating chopper gun, be sure to check

    a) catalyst setting.
    b) where weights will be placed.
    c) make sure gun is clean.
    d) none of the above.

14. When using gun chop

    a) all the board.
    b) chop around the edges.
    c) don't chop on board at all.
    d) none of the above.

ESSAY

15. Write an essay on why stiffening is so important.

THE PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

PIPESTONE COUNTY PAVTI

Pipestone, MN

Course of Instruction for Vocational Popping
For Adult and Post-Secondary Classes

DEVELOPED BY

Dean Tuin

November 1980

APPROVALS:

Marv Thomsen: Director of Pipestone Area
Vocational-Technical Institute

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

INTRODUCTION

I

The popping and assembly program is designed to meet the employment needs of the fiberglass industry. It provides entry level refresher and technical popping and assembly skills competency training.

COURSE LENGTH:
11 months - 1272 clock hours
8 months in school
3 months on-the-job-training
6 hours per day, 5 days per week
2 hours class time - 4 hours shop

EDUCATIONAL OBJECTIVES:

1. To provide employment skills in popping and assembly for the economically disadvantaged.
2. To provide training for those currently employed in popping, but find it necessary or desirable to expand or upgrade their skills and knowledge.
3. To meet the local, regional and state popping and assembly employment and training needs of the industry.
4. To upgrade the social economic level of the area labor force.
5. To provide the only training available in the state of Minnesota for popping.

Safety
Tools
Inspection
Cleaning
Breaking Flanges Free
Popping

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

DIVISION OF COURSE OF POPPING

Phase I	Class Time	two hours per day for 4 weeks
Phase II	Shop or Lab	four hours per day for 4 weeks

STUDENTS ROTATION PLAN

GROUPS		
WEEKS	CLASS TIME	SHOP OR LAB
4	A	
4		A

CLASS TIME:

1. Layout of course construction
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools Needed
   - e) Materials Needed
   - f) Summary
   - g) Evaluation

2. Shop or Lab Work
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools
   - e) Materials
   - f) Performance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

OBJECTIVES:

You will do the following:

1. State the main steps in popping.
2. Identify all tools and materials that are used in popping.
3. Know all safety precautions necessary for working in popping.

ACTIVITY:

1. All information needed will be put on blackboard, which you will copy for your information.
2. Observe diagnostic techniques and practice the step-by-step popping procedures.
3. Test popping by the use of diagrams, with proper safety equipment.
4. Perform popping on mold until diagnostic skills are attained.

DEVELOP GOOD WORK HABITS:

1. Provide specific standards for each job. Discuss these with students.
2. Provide a clean, organized workshop that is conductive to good learning.
3. Discuss with students the importance of good work habits in relation to industrial practice, job advancement, etc.
4. Require that all work be tested according to popping standards.

COORDINATE THE SCHOOL SHOP ACTIVITIES WITH THE TRADE:

1. Arrange a constant visitation schedule with local fiberglass industries.

CLASSIFY THESE WITH POPPING

Safety Precautions

Room Ventilation

Applying Wedges

Using Mallet

Using Water Hose

Using Air Hose

Using Chisel

Mold Release

POPPING DEPARTMENT

Course Outline on Daily Basis

Course Popping
Grade Level Adult

Instructor Dean Tuin
Section 5

DATE	TOPIC	ACTIVITIES	TEXT ASSIGNMENTS	METHODS AND AIDS
12-1-81	Safety Popping Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
12-2-81	Safety Popping Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
12-3-81	Safety Popping Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
12-4-81	Safety Popping Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
12-5-81	Safety Popping Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Operation SUBJECT: Popping

FOR THE STUDENTS SERVICE

APPLYING POPPING:

OBJECTIVES:

At the completion of this lesson you will be able to properly pull by using correct tools and methods to correct specifications.

1. Applying Wedges
2. Mallet
3. Water Hose
4. Air Hose
5. Chisel
6. Mold Release

ACTIVITY:

Careful use of tools will result in a superior popping job for production. These instructions are intended to help you pop out a product without scratching the mold.

*NOTE: Before poppling things to check:

a) Check for correct stiffening
    1) Tell proper people if not correct

b) Breaking flange free
    1) Never use metallic instrument down sides.
    2) Use plastic or wood wedges.
    3) If mold refuses to come out, use air or water hoses.
    4) Do not use mallet on flat surface.
    5) Clean flanges with chisel before returning mold back to mold prep.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Job Sheet SUBJECT: Popping

COURSE: Beginning Shop Practice

TOOLS AND EQUIPMENT:

1. Safety Glasses
2. Steel Toe Shoes
3. Hard Hats
4. Water Hose
5. Air Hose
6. Chisels
7. Waxes
8. Mallet
9. MGM 16 Mold Release

PROCEDURES:

1. Before starting popping, check all stiffening to be sure it is correct.
2. Tell proper people if it is not correct.
3. When breaking flanges free, never use metallic instruments down side.
4. In popping, if product does not release from mold, use air to separate apart.
5. If air does not work use water to float the product from the mold.
6. If product still has not been released, use rubber mallet, but only on stiffening.
7. Clean flanges before sending mold back to mold prep.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Information Topics SUBJECT: Popping

Safety Precautions in Using Air Hose, Chisels and Mallets

When using air hose, make sure hose is secured to compressor. In most compressors, the air pressure is 150 pounds or better, which can seriously injure a person. When using air hose make sure safety glasses are used.

When using chisels for cleaning flanges, use gloves to protect the hands. When working with fiberglass that is cured, it can cut or cause an infection. Make sure safety glasses are used.

When using a mallet, make sure safety glasses are worn to protect the eyes in case the handle breaks.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

EVALUATION

OBJECTIVES:

You will do the following:

1. At the completion of this lesson you will be able to properly pull by using correct tools and methods to correct specifications.

2. How lesson will be conducted.

ACTIVITY:

1. Read the information given to you in class, with the library research lesson.

2. Take a sheet of paper and divide it equally into three columns, the heading for the first column should be On The Job Safety Equipment; second column should be Supplies; third column should be Inspection of Popping.

3. Turn to research lesson and look at the list of goods. Group each of the goods into one of the three categories.

4. Give reasons why these steps are so important in a good finish product.

5. Turn your answer sheet into the instructor.

Information About Popping

Whenever pulling products out of molds, they all have to use the same basic groups: on the job safety, supplies and inspection of popping. Safety is important in all phases of shop work, and it is no less important in using good safety precautions in the popping area. A safe worker has respect for the tools, equipment and materials with which he or she works. The safety precautions taken include the use of safety glasses and protective gloves. Whenever breaking flanges free, never use metallic instruments down the sides.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

STUDENT ACHIEVEMENT TEST

Complete the following statements by writing in the words.

1. List four safety precautions in working with popping.

   a)
   b)
   c)
   d)

2. List three equipments needed for popping.

   a)
   b)
   c)

3. List two inspections needed before starting popping.

   a)
   b)

4. In breaking flanges, why do you never use metallic instruments? ______________________

Circle the "T" in front of the statement if it is correct.
Circle the "F" in front of the statement if it is not correct.

T F 5. As long as you use a rubber mallet, it does not matter where you pound on the mold.

T F 6. If finish product does not release from mold by pulling, use water to float it out.

T F 7. When cleaning flanges, never use metallic tools.

T F 8. If stiffening is not correct, after inspection, tell proper people.

T F 9. When using rubber mallet, use just on stiffening, and only if necessary.

Supplies - that will be used by the manufacturer that you will have to know and operate include air hoses, water hoses, wedges, mallets and chisels.

Inspection of popping - recommended by the manufacturer, that a person will have to know how to check for correct stiffening.

Classify these goods into the three categories

Water Hoses

Safety Glasses

MGM 16 Mold Release

Hard Hats

Air Hoses

Steel Toe Shoes

Mallets

Protective Gloves

Multiple Choice - mark the one you think answers the question.

10. When breaking flanges free, use

a) chisel.
b) screw driver.
c) plastic wedge.
d) none of the above.

11. When using rubber mallet, use just on

a) stiffen.
b) transon.
c) bow.
d) none of the above.

12. The most important thing to know in coming into the popping area, is

a) having tools needed.
b) safety.
c) knowing where to start.
d) none of the above.

13. When cleaning flanges, use a

a) chisel.
b) rubber mallet.
c) power saw.
d) none of the above.

Essay

14. Write an essay on why popping correctly is so important.

THE PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE
PIPESTONE COUNTY PAVTI
Pipestone, MN

Course of Instruction for Vocational Grinding
For Adult and Post-Secondary Classes

DEVELOPED BY
Dean Tuin
November 1980

APPROVALS:
Marv Thomsen: Director of Pipestone Area
Vocational-Technical Institute

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

INTRODUCTION

I

The grinding and assembly program is designed to meet the employment needs of the fiberglass lamination industry. It provides entry level refresher and technical grinding and assembly skills competency training.

COURSE LENGTH: 11 months - 1272 clock hours
8 months in school
3 months on-the-job-training
6 hours per day, 5 days per week
2 hours class time - 4 hours shop

EDUCATIONAL OBJECTIVES:

1. To provide employment skills in grinding and assembly for the economically disadvantaged.
2. To provide training for those currently employed in grinding, but find it necessary or desirable to expand or upgrade their skills and knowledge.
3. To meet the local, regional and state grinding and assembly employment and training needs of of the industry.
4. To upgrade the social economic level of the area labor force.
5. To provide the only training available in the state of Minnesota for grinding.

Safety
Inspection
Tools
Grinding Fiberglass
Guages
Summary
Evaluation

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

DIVISION OF COURSE OF GRINDING

Phase I	Class Time	two hours per day for 4 weeks
Phase II	Shop or Lab	four hours per day for 4 weeks

STUDENTS ROTATION PLAN

GROUPS		
WEEKS	CLASS TIME	SHOP OR LAB
4	A	
4		A

CLASS TIME:

1. Layout of course construction
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Tools Needed
   - e) Materials Needed
   - f) Summary
   - g) Evaluation
2. Shop or Lab Work
   - a) Job Safety
   - b) Supplies
   - c) Inspection
   - d) Materials
   - e) Performance

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

OBJECTIVES:

You will do the following:

1. State the main steps in grinding.
2. Identify all tools and materials that are used in grinding.
3. Know all safety precautions necessary for working in grinding.

ACTIVITY:

1. All information needed will be put on blackboard, which you will copy for your information
2. Observe diagnostic techniques and practice the step-by-step grinding procedures.
3. Test grinding by the use of a guage with proper safety equipment.
4. Perform grinding on finish product until diagnostic skills are attained.

DEVELOP GOOD WORK HABITS:

1. Provide specific standards for each job. Discuss these with students.
2. Provide a clean, organized workshop that is conductive to good learning.
3. Discuss with students the importance of good work habits in relation to industrial practice, job advancement, etc.
4. Require that all work be tested according to grinding standards.

COORDINATE THE SCHOOL SHOP ACTIVITIES WITH THE TRADE:

1. Arrange a constant visitation schedule with local fiberglass industries.

CLASSIFY THESE WITH GRINDING

Safety Precautions

Grinding Fiberglass

Inspection

Using Guage

Materials that are used

Tools

GRINDING DEPARTMENT

Course Outline on Daily Basis

Course Grinding

Grade Level Adult

Instructor Dean Tuin

Section 6

DATE	TOPIC	ACTIVITIES	TEXT ASSIGNMENTS	METHODS AND AIDS
1-1-82	Safety Grinding Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
1- -82	Safety Grinding Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
1- -82	Safety Grinding Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
8- -82	Safety Grinding Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing
8- -82	Safety Grinding Labor Shop	Class Time Class Time Lab Shop	Safety Projects	Exercise Blackboard and Assignments Learning by Doing

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Operation SUBJECT: Grinding

FOR THE STUDENTS SERVICE

GRINDING:

OBJECTIVES:

At the completion of this lesson you will be able to determine the readiness of grinding, use proper tools and materials to correct specifications.

1. Grinder
2. Guage
3. Filler
4. Catalyst

ACTIVITY:

Careful use of grinder and checking with guage will result in a superior grinding job for production. These instructions are intended to help you make the best possible product.

*NOTE: Before grinding things to check:

a) Make sure lamination is cured.
  1) Touch to make sure.
  2) If tacky wait (if repaired).

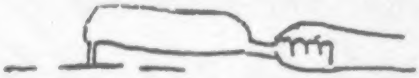
b) Don't grind too deep.
  1) Use guage to check.

c) Before using grinder
  1) Check to see if blades are not cracked.
  2) Not only for better grinding but for safety.

d) Use safety glasses or hood.

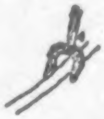
1. When grinding keep blades flat and even. (SEE FIGURE 1*)

FIGURE 1



2. Check for thickness of glass by use of gauge. (SEE FIGURE 2*)

FIGURE 2



IN GRINDING:

1. Make sure to use safety glasses or hood protection.
2. Keep grinder blade flat so not to grind too deep.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Job Sheet SUBJECT: Grinding

COURSE: Beginning Shop Practice

TOOLS AND EQUIPMENT:

1. Safety Glasses or Hood Protection
2. Grinder
3. Guage
4. Respirators

MATERIALS:

1. Filler
   a) Chopped Fiberglass
   b) Resin
   c) Catalyst

PROCEDURES:

1. Before starting grinding, make sure lamination is cured.

2. Before using grinder, check to see if blades are tight and are not cracked.

3. Don't grind too deep.

4. Use safety equipment before starting.

5. Use guage to check for thichness.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

TITLE: Information Topics SUBJECT: Grinding

Safety Precautions in Using Grinder

Resin and catalyst are oxidizing materials. They are usually extremely flammable and may decompose with explosive violence if handled incorrectly. They should be kept away from fire or flame and used in a well ventilated room. They should be stored in a cool, dry place.

Epoxy curing agents will produce chemical burns if they come in contact with the skin. They can develop skin irritations and even dermatitis in extreme cases. The danger is slight when these materials are used properly and in small quantities, never the less, the danger remains.

When adding catalyst to resin care should be taken to follow the manufacturers recommendations exactly. When using materials, make sure that safety glasses, respirators and rubber gloves are used.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

EVALUATION

OBJECTIVES:

You will do the following:

1. At the completion of this lesson you will be able to determine the readiness of grinding and use proper tools and materials to correct specifications.
2. How lesson will be conducted.

ACTIVITY:

1. Read the information given to you in class, with the library research lesson.
2. Take a sheet of paper and divide it equally into three columns, the heading for the first column should be On The Job Safety Equipment; second column should be Supplies; third column should be Inspection of Grinding.
3. Turn to your research lesson and look at the list of goods. Group each of the goods into one of the three categories.
4. Give reasons why these steps are so important in a good finish product.
5. Turn your answer sheet into the instructor.

Information About Grinding

Manufacturers produce many different types of goods for use. But regardless of what type of goods are produced, they all have to use the same basic groups: on the job safety, supplies and inspection of grinding.

On the job safety - generally speaking grinding, the use of resin and catalyst are safe for the average person to handle, if certain precautions are taken. Safety is important in all phases of shop work, and it is no less important in using resin and catalyst. Learn the rules of safety and establish safe working habits. A safe worker has respect for the tools, equipment and materials with which he or she works. The safety precautions taken include the use of respirators, safety glasses or hood protection, room ventilation, protecting the skin and the handling of curing agents.

Supplies - that will be used by the manufacturer that you will have to know and operate include grinder, guage, filler and catalyst.

Inspection of grinding - make sure lamination is cured. Don't grind too deep, check grinder blades for tightness and cracks and use of safety equipment.

Classify these goods into the three categories

Grinder

Safety Glasses or Hood Protection

Guage

Roller

Catalyst

Respirators

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

November 3, 1980

STUDENT ACHIEVEMENT TEST

Complete the following statement by writing in the words.

1. Describe two supplies used in grinding.

   a)
   b)

2. List three safety precautions in working with grinding.

   a)
   b).
   c)

3. List three inspections needed before starting grinding.

   a)
   b)
   c)

4. Why keep grinder flat when grinding? ____________________________

Circle the "T" in front of the statement if it is correct.
Circle the "F" in front of the statement if it is not correct.

T F 5. Safety is the number one concern going into grinding.

T F 6. Grinder should be held at a 60 degree angle.

T F 7. Safety glasses do not have to be worn at all times, just when grinding.

T F 8. Filler is made up of chopped up glass and resin.

T F 9. A guage is used to check the thickness of fiberglass.

Multiple Choice - mark the one you think answers the question.

10. Polyester resin and catalyst are what kind of materials?

    a) cloth
    b) accelerator
    c) oxidizing
    d) none of the above

11. Epoxy curing agents will produce what degree of burns?

    a) first degree
    b) second degree
    c) third degree

12. Mix about eight ounces of resin with what amount of catalyst?

    a) 40 drops
    b) 12 drops
    c) 100 drops
    d) none of the above

13. The first thing to do when going into a grinding room is to

    a) check the grinder.
    b) check the guage for proper setting.
    c) make sure lamination is cured.
    d) none of the above.

14. Make sure lamination is cured by using a

    a) grinder.
    b) fingers.
    c) a guage.
    d) none of the above.

Essay

15. Write an essay on why grinding is so important.

FIBERGLASS LAMINATION PROGRAM

PIPESTONE AREA VOCATIONAL-TECHNICAL INSTITUTE

February 18, 1980

REFERENCE PAGES

Library Research and Report Assignment

Instruction Fiberglass Lamination

This library research lesson supplements the information provided in the following self-instructional multimedia units
UT-IF - Plyfoam New Workshop Wonder

After completing the selected reading below, you should be able to:

1. describe five materials used for lamination
2. list five safety precautions in handling curing agents
3. list ten tools and equipment used for lamination

REFERENCES

[1] Gerald L. Steele, Fiberglass Product and Procedures; Industrial Art; Long Lake, Minnesota 55356.

[2] Charles Bill, How to Build Fiberglass Boats; New York: Howard-McCann Inc; 1957

[3] Coating and Molding With Fiberglass; Boston: Allied Resin Products Co.; 216 Milk St; 1965: Pg 24.

The Pipestone Area Vocational Technical Institute

Pipestone County PAVTI

Pipestone, MN

Course of Instruction for Vocational Mold Making

Developed By

Dean Tuin

November 1980

Approval: Marv Thomsen
Director, Pipestone Area Vocational
Technical Institute

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

INTRODUCTION

I

The mold making and assembly program is designed to meet the employment needs of the fiberglass lamination industry. It provides entry level refresher and technical mold making and assembly skills competency training.

Course Length:
11 months - 1272 clock hours
8 months in school
3 months on-the-job-training
6 hours per day
5 days per week
2 hours class time
4 hours shop

Educational Objective:

1. To provide employment skills in mold making and assembly for the economically disadvantaged.
2. To provide training for those currently employed in mold making, but find it necessary or desirable to expand or upgrade their skills and knowledge.
3. To meet the local, regional and state mold making and assembly employment and training needs of the industry.
4. To upgrade the social economic level of the area labor force.
5. To provide the only training available in the state of Minnesota for mold making and assembly.

Safety
Inspection
Tools
Materials
Making of Mold
Fiberglass Roller
Spray Gun
Summary
Evaluation

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

Division of Course of Mold Making

Phase I Class Time...........................	two hours per day for four weeks
Phase II Shop or Lab.........................	four hours per day for four weeks

Students Rotation Plan

	GROUPS	
Weeks	Class Time	Shop or Lab
4	A	
4		A

Class Time:

1. Layout of course construction.
   - a. Job safety.
   - b. Supplies.
   - c. Inspection.
   - d. Tools needed.
   - e. Materials needed.
   - f. Summary.
   - g. Evaluation.

2. Shop or lab work.
   - a. Job safety.
   - b. Supplies.
   - c. Inspection.
   - d. Tools.
   - e. Materials.
   - f. Performance.

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

Objectives;

You will do the following:

1. State the main steps in mold making.
2. Identify all tools and materials that are used in mold making.
3. Know all safety precautions necessary for working in mold making.

Activity:

1. All information needed will be put of black board, which you will copy for your information.
2. Observe diagnostic techniques and practice the step-by-step mold making procedures.
3. Test mold making by the producing of finished product.

Develop good working habits:

1. Provide specific standards for each job. Discuss these with students.
2. Provide a clean, organized workshop that is conductive to good learning.
3. Discuss with students the importance of good work habits in relation to industrial practice, job advancement, etc.
4. Require that all work be tested according to lamination standards.

Coordinate the school shop activities with the trade:

1. Arrange a constant visitation schedule with local fiberglass industries.

Classify these with mold making

Safety Precautions

Room Ventilation

Handling Curing Agent

Protecting the Skin

Strength of Materials

Materials that are Used

Tools

Fiberglass Lamination Program

Course Outline on Daily Basis

Course Mold Making

Instructor Dean Tuin

Grade Level Adult

Section VII

Date	Topic	Activities	Test Assignments	Methods and Aids
2-2-82	Safety Mold Making Labor Shop	Class Time Class Time Lab Time	First Aid and C.P.R. Projects and Procedures	Blackboard Assignments Learning by Doing
2-3-82	Safety Mold Making Labor Shop	Class Time Class Time Lab Time	First Aid and C.P.R. Projects and Procedures	Blackboard Assignments Learning by Doing
2-4-82	Safety Mold Making Labor Shop	Class Time Class Time Lab Time	First Aid and C.P.R. Projects and Procedures	Blackboard Assignments Learning by Doing
2-5-82	Safety Mold Making Labor Shop	Class Time Class Time Lab Time	First Aid and C.P.R. Projects and Procedures	Blackboard Assignments Learning by Doing
2-5-82	Safety Mold Making Labor Shop	Class Time Class Time Lab Time	First Aid and C.P.R. Projects and Procedures	Blackboard Assignments Learning by Doing

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

TITLE: Operations SUBJECT: Mold Making

For the Students Service

Applying Mold Layup:

Objective:

At the completion of this lesson you will be able to operate all relevent equipment, tools and produce a good mold to correct specifications.

1. Resin.
2. Catalyst.
3. Acetone.
4. Rollers.
5. Paint Brush.
6. Scissors.
7. Fiberglass Mat.
8. Trim Knife.
9. Plywood.
10. Tape Measure.

Activity:

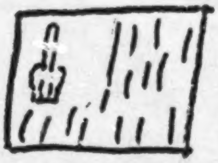
Careful use of materials will result in a superior mold. These instructions are intended to help you make the best possible product.

*Note: Before mold making things to check:

- a. Cover the bench top or work surface to catch all drippings to protect the bench and floor.
- b. Cut all fiberglass materials ahead of time and have all materials laid out ready for use.
- c. Have all tools checked to make sure of proper working order.

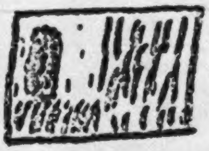
1. Start your project by making a suitable mold from 3/4 inch plywood.
2. Add about 1% to 2% catalyst (about 4 to 8 drops Mek Peroxide) to the resin and mix thoroughly. The recommended room temperature is 72 to 74 degrees F.
3. Brush this mixture onto the plywood evenly, building up a thickness of about .02 to .03 inches - about the thickness of a tablet back cardboard. Brush it on smoothly and recover any spots that might soak in right away. (See figure 1)

Figure 1



6. Clean your brush immediately with acetone and allow resin to cure (usually 1 to 3 hours) on plywood.
7. Sand the cured resin lightly to remove the surfacing agent which might prevent the next resin coat from sticking to the final coat. (See figure 2)

Figure 2



8. Do this same process three times to make sure that the mold does not stick using 320 sandpaper (wet).
9. After finishing last step with 320 wet sandpaper, then use 400 wet and 600 wet.
10. Buff with compound to a high luster. Then use MGM-3-10 and three times with 16.

Date: November 3, 1980 Task Number 7
Subject: Mold Making
Objective: At the completion of this lesson you will be able to operate all relevent equipment, tools and produce and shine pack to correct specifications.

Teaching Aid Equipment	Visual Aid Number	On The Job Safety Equipment	Machine and Attachment	Supplies
1.	1.	1. Respirators	1.	1. Rollers
2.	2.	2. Safety Glasses	2.	2. Scissors
3.	3.	3. Steel Toe Shoes	3.	3. Fiberglass Mat
4.	4.	4.	4.	4. Utility Knives
5.	5.	5.	5.	5. Corner Rollers
6.	6.	6.	6.	6. Catalyst
				7. Resin
				8. Paint Brush
				9. Buffer w/Compound
				10. MGM-3-10-16
				11. Sandpaper (240-320-400-600)

APPLICATION

Teaching Steps Key points to say or do

Lesson Introduction:

State Objectives - How lesson will be conducted

Lesson Presentation:

Outline:

Inspection of Mold Making.

1. Make sure gelcoat is twice as thick as a finished product.
2. Make sure there is enought layers of mat so that the mold will not lose shape (between 5 and 15 layers of 3 to 4 ounce mat).
3. Put only one layer of mat on at a time and make sure each layer is set before going to the next layer.
4. Make sure that all air is removed.

Tools.

1. Show all tools.
2. How to use.

Materials.

Explain different types.

1. Mat.
2. Resin.
3. Catalyst.
4. Sandpaper.
5. Gelcoat.
6. Wood.

Teaching Steps | Key Points to Say or Do

Making the form for mold.

1. Explain.
2. Show how.
3. Explain best use.

Gelcoating.

1. Explain.
2. Show how.
3. Explain thickness.

Check for air.

1. Why look for air?
2. What is it?
3. How to get it out?
4. Why get it out?

Sanding.

1. Why sand?
2. What grades of paper to use?
3. How to use it?

Summary.

1. Restate objective.
2. Review techniques.
3. Questions and answers.

Evaluation.

1. Performance.

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

Title: Job Sheet Subject: Mold Making

Course: Begninning Shop Practice

Tools and Equipment:

1. Respirators.
2. Safety Glasses.
3. Scissors.
4. Utility Knife.
5. Wood.
6. Corner Roller.
7. Paint Brush.
8. Buffer.
9. Sandpaper.
10. Rollers.

Materials:

1. Fiberglass Mat.	MGM 1
2. Resin.	MGM 3
3. Catalyst.	MGM 10
4. Compound.	MGM 16

Procedure:

1. A mold product can be made from metal, glass, fiberglass, wood, or other non-porous material.
2. Mix about eight ounces of mold resin with 32 to 42 drops of catalyst.
3. If the humidity is not 50% and temperature is not between 72 and 74 degrees, variation in the amount of catalyst may be necessary.
4. A mold made of fiberglass and a finished product should be checked for chips, scratches and fractures. If found, patch with chopped glass with gelcoat, sand with 320-400-600 wet, wipe with acetone, spray with gelcoat, and sand with 400 and 600 wet sandpaper.
5. Then buff with compound, wax with MGM 1, 3, 10 and three times with mold release.
6. Spray gelcoat between 14 and 18 mills, let cure and repeat.
7. Brush resin and catalyst mixed on to the surface.
8. Add the fiberglass mat (2 oz per square foot) it should be 1 or 2 inches larger than the mold in dimensions.
9. Brush on a coat of resin, do not get wet.
10. Using lamination roller work out all the air bubbles, and completely saturating the fiberglass mat.
11. Let set and trim with utility knife.
12. Repeat the lamination part until you have the straight need for the. size of mold.

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

November 3, 1980

Title: Information Topics Subject: Mold Making

Safety Precautions in Mixing Resin, and Handling Curing Agents

Catalyst for polyester resin are oxidizing materials. They are usually extremely flammable and may decompose with explosive violence if handled incorrectly. They should be kept away from fire or flame and used in a well ventilated room. They should be stored in a cool, dry place.

Eposy curing agents will produce chemical burns if they come in direct contact with the skin. They can develop skin irritation and even dermatitis (not likely with polyester) in extreme cases. The danger is slight when these materials are used properly and in small quantities, never the less, the danger remains.

When adding catalyst to the resin, care should be taken to follow the manufacturers recommendation exactly. Some resin use catalyst which are in two parts. Part one is usually an accelerator and part two is generally called a catalyst. These two chemicals if mixed directly together can rapidly decompose or explode. Be sure to mix these parts into the resin separately. Mix the resin and accelerator thoroughly before adding and mixing the catalyst.

In the resin which has only one catalyst, the accelerator has been added to the resin at the factory. This eliminates the need for special caution during this operation.

Fiberglass Lamination Program

Pipestone Area Vocational Technical Institute

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Evaluation

Objective:

You will do the following:

1. At the completion of this lesson you will be able to operate all relevent equipment, tools and produce a good mold to correct specifications.
2. How lesson will be conducted.

Activity:

1. Read the information given to you in class, with the library research lessons.
2. Take a sheet of paper and divide it equally into three columns; the heading for the first column should be On the Job Safety Equipment; second column should be Supplies; third column should be Inspection of Mold Making.
3. Turn to your research lesson and llok at the list of goods. Group each goods into one of the three categories.
4. Name products that are made from fiberglass in your community.
5. Turn your answer sheet in to the instructor.

Information about Mold Making:

Manufacturers produce many different types of goods for use. Regardless of what type of goods are produced, they all have to use the same basic groups: On the job safety, Supplies, and Inspection of mold making.

On the Job Safety - Generally speaking, fiberglass materials are safe for the average person to handle if certain precautions are taken. Safety is important in all phases of shop work, and it is no less important in using fiberglass. Learn the rules of safety and establish safe working habits. A safe worker has respect for the tools, equipment and materials with which he works. The safety precautions taken are the use of respirators, safety glasses, room ventilation, protecting the skin and the handling of curing agents.

Supplies - that will be used by the manufacturers that you will have to know and operate include rollers, scissors, utility knives, corner rollers, catalyst, resin, fiberglass mat, acetone, paint brushes, buffer with compound, MGM I, MGM III, MGM 10, and MGM 16.

Inspection of Mold Making - recommended by the industry, that a person will have to know how to check for scratches, chips and fractures.

Classify these goods into the three categories:

Chips
Rollers
Fiberglass Mat
Scissors
Respirators
Paint Brush
Resin
Utility Knife
Safety Glasses
Corner Roller
Catalyst
MGM 1
Acetone
MGM 111
Fractures
MGM 10
Scratches
MGM 16
Compound with buffer

Fiberglass Lamination Program

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Student Achievement Test

Complete the following statements by writing in the words.

1. Describe five materials used in mold making.

    a.
    b.
    c.
    d.
    e.

2. List three safety precautions in working with mold making.

    a.
    b.
    c.

3. List ten tools and equipment used in mold making.

    a.
    b.
    c.
    d.
    e.
    f.
    g.
    h.
    i.
    j.

4. List three materials mold can be produced from.

    a.
    b.
    c.

Circle the "T" in front of the statement if it is correct.
Circle the "F" in front of the statement if it is not correct.

T F 5. A mold prodeuct can be made from nonporous material.

T F 6. Mix about 24 ounces of mold resin with 32 to 48 drops of catalyst.

T F 7. Whenever sandpaper is used on a mold, it is a must to go through all the wax steps.

T F 8. If the humidity is not 50% and temperature is not between 72 and 74 degrees, variation in the amount of catalyst may be necessary.

T F 9. The steps used in waxing a mold are MGM I, MGM III, MGM 10 and MGM 16 mold release.

Multiple Choice - Mark the one you think answers the question.

10. Catalyst for polyester resin are what kind of material.

    a. Oxidyzing.
    b. Accelerator.
    c. Craging.
    d. None of the above.

11. Curing time for each lamination step is

    a. three to four hours.
    b. ten to twelve hours.
    c. one to two hours.
    d. none of the above.

12. When sanding, the last paper to use is

    a. 60 sandpaper.
    b. 600 sandpaper.
    c. 400 sandpaper.
    d. none of the above.

13. When waxing, the first step is

    a. MGM III.
    b. MGM 10.
    c. MGM I.
    d. Compound with buffer.

14. In repair work, the last sandpaper used before gelcoating is

    a. 600 sandpaper.
    b. 400 sandpaper.
    c. 100 sandpaper.
    d. 240 sandpaper.

Essay.

15. Write an essay on how to make a mold.